

REMARKS

Applicant has carefully reviewed the Office Action mailed February 24, 2009 and offers the following remarks.

Applicant wishes to thank the Examiner for indicating that claim 5 is allowed and that claims 14 and 44-47 would be allowable if rewritten in independent form. Applicant reserves the right to rewrite claims 14 and 44-47 at a later time.

Applicant notes that claim 9 has not been addressed in the Office Action mailed February 24, 2009. As such, Applicant will proceed as if claim 9 has been deemed to contain allowable subject matter.

Claims 2-4, 6-8, 13, 15-20, 22, 26-28, 32, 34, 35, 38-43, 48-55, and 57-60 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,873,606 B2 to Agrawal et al. (hereinafter “Agrawal”). Applicant respectfully traverses. For a reference to be anticipatory, the reference must disclose each and every claim element. Further, the elements of the reference must be arranged as claimed. M.P.E.P. § 2131. The requirement that each and every element be disclosed in the manner claimed is a rigorous standard that the Patent Office has not met in this case.

Claim 16 recites a method of processing signals to be transmitted to receivers on a plurality of communication channels, comprising:

determining pre-coding signal weights based on channel state information associated with the plurality of communication channels to provide proportional power allocation to the signals;

applying the pre-coding signal weights to the signals;

transmitting weighted signals to the receivers on the plurality of communication channels; and

at each of the receivers:

receiving a subset of the weighted signals over a sub-group of the plurality of communication channels; and

decoding the subset of the weighted signals using inverses of the pre-coding signal weights based on the channel state information associated with the sub-group of the plurality of communication channels.

Agrawal does not teach “receiving a subset of the weighted signals over a sub-group of the plurality of communication channels” at each of the receivers, as recited in claim 16.

Agrawal also does not disclose “decoding the subset of the weighted signals using inverses of the pre-coding signal weights based on the channel state information associated with the sub-group of the plurality of communication channels” at each of the receivers, as recited in claim 16. The Patent Office alleges that Agrawal discloses receiving a subset of weighted signals over a sub-group of the plurality of communication channels in that the subset and sub-group is a number equal to or less than the total number of weighted signals and the total number of communication channels. The Patent Office also states that the signals in Agrawal are coded for transmission using the signal weights and that the receiver will conduct the opposite of the coding process to recover the signal data such that the received signals are decoded using an inverse of the encoding process (Office Action mailed February 24, 2009, pp. 2-3). Applicant disagrees that Agrawal discloses that a subset of the weighted signals over a sub-group of the plurality of communication channels is received at each receiver for the reasons set forth in the Response filed December 18, 2008. Agrawal is silent as to subsets of weighted signals and sub-groups.

Moreover, what the Patent Office’s position ignores is that claim 16 recites that at the receiver, a subset of the weighted signals over a sub-group of the plurality of communication channels and the subset of the weighted signals is decoded using inverses of the pre-coding signal weights based on the channel state information associated with the sub-group of the plurality of communication channels. Agrawal does not disclose that the subset is decoded using inverses of the pre-coding signal weights based on channel state information associated with the sub-group. Instead, Agrawal discloses that the data symbol stream to be transmitted is scaled with a respective weight corresponding to the amount of transmit power allocated to that stream (Agrawal, Abstract). If, according to the Examiner’s position, this symbol stream is decoded at the receiver by conducting the opposite of the coding process, then the symbols in Agrawal will be decoded using the inverse of the weight corresponding to the amount of transmit power allocated to the entire symbol stream.

Accordingly, Agrawal does not teach using the channel state information associated with a sub-group of the plurality of communication channels to decode a subset of the received weighted signals at the receiver. There is no indication in Agrawal that the weighted signals are divided into subsets, where a subset of the weighted signals is received over a particular sub-group of the plurality of communication channels, and the subset is then decoded using inverses

of the pre-coding signal weights based on the channel state information associated with that particular sub-group. Depending on the particular sub-group and the channel state information associated with it, dividing the weighted signals into subsets, where a subset of the weighted signals is decoded using inverses of the pre-coding signal weights based on the channel state information associated with that particular sub-group, may result in a different decoding outcome. Since Agrawal does not mention dividing the weighted signals into subsets, where a subset of the weighted signals is received over a particular sub-group of the plurality of communication channels, and the subset is then decoded using inverses of the pre-coding signal weights based on the channel state information associated with that particular sub-group, Agrawal does not teach each and every element of claim 16. Claim 16 is therefore not anticipated by Agrawal.

To summarize, in claim 16, the pre-coding signal weights are based on channel state information associated with the plurality of communication channels, and the decoding is done on subsets of the received weighted signals using inverses of the pre-coding signal weights based on the channel state information associated with the sub-group of the plurality of communication channels. Agrawal does not teach this method of coding and decoding, where subsets of weighted signals are decoded using inverses of the pre-coding weights that are based on channel state information of only a sub-group of the communication channels. Thus, since Agrawal fails to disclose that at each of the receivers, the steps of “receiving a subset of the weighted signals over a sub-group of the plurality of communication channels” and “decoding the subset of the weighted signals using inverses of the pre-coding signal weights **based on the channel state information associated with the sub-group of the plurality of communication channels**,” are performed, Agrawal fails to teach each and every element of claim 16. Claim 16 is therefore not anticipated by Agrawal.

Claims 2-4, 6-8, 15, and 57 depend directly or indirectly from claim 16, and are patentable based on their dependency from claim 16.

Claim 13 is an independent claim that recites limitations similar to those recited in claim 16. Thus, claim 13 is also patentable over Agrawal for at least the same reasons set forth above with respect to claim 16. In addition, the Patent Office has not pointed with particularity to any portion of Agrawal that discloses a MIMO system “that provides respective $N \times N$ sub-MIMO channels from the transmitter to the receivers, wherein each of the groups of signals comprises

N signals,” as recited in claim 13. Agrawal does not teach $N \times N$ sub-MIMO channels as claimed in claim 13. Claim 13 is therefore patentable for this additional reason.

Moreover, the Patent Office has not pointed with particularity to any portion of Agrawal that discloses “wherein the signals comprise respective groups of signals to be transmitted to the receivers, wherein determining the pre-coding signal weights further comprises determining the pre-coding signal weights to separate the respective groups of signals,” as recited in claim 13. Agrawal is silent as to separating the respective groups of signals by determining the pre-coding signal weights. Claim 13 is therefore patentable for this additional reason.

Furthermore, the Patent Office has not pointed with particularity to any portion of Agrawal that discloses “wherein determining the pre-coding signal weights comprises determining elements of a pre-coding matrix P such that a combined communication channel matrix $C = HP$ has a form of U $N \times N$ sub-matrices, diagonal elements of which are respective diagonal elements of C , and elements of C outside the $N \times N$ sub-matrices are forced to zero,” as recited in claim 13. Agrawal does not disclose U number of $N \times N$ sub-matrices. Claim 13 is therefore patentable for this additional reason.

Claim 17 has limitations similar to those recited in claim 16. Thus, claim 17 is also patentable over Agrawal for at least the same reasons set forth above with respect to claim 16.

Claims 18-20, 22, 26-28, and 58 depend from claim 17 and include all of the limitations of claim 17. Claims 18-20, 22, 26-28, and 58 are thus patentable over Agrawal for at least the same reasons set forth above with respect to claim 17.

Independent claims 32 and 35 have similar limitations to those recited in claims 16 and 17 and are thus patentable for at least the same reasons set forth above with respect to claims 16 and 17.

Claims 34 and 59 depend from claim 32 and include all of the limitations of claim 32. Claims 38 and 60 depend from claim 35 and include all of the limitations of claim 35. Claims 34, 38, 59, and 60 are thus patentable over Agrawal for at least the same reasons set forth above with respect to claims 32 and 35.

Claim 39 is an independent method claim that recites a method of processing signals to be concurrently transmitted to receivers over a plurality of communication channels comprising: determining channel state information for the plurality of communication channels;

determining a spatial coding matrix comprising a respective set of spatial coding weights for each of the receivers based on the channel state information; and

applying the respective set of spatial coding weights in the spatial coding matrix to the signals.

The Patent Office has not cited to any portion of Agrawal that discloses determining a spatial coding matrix comprising **a respective set of spatial coding weights for each of the receivers** based on the channel state information, as recited in claim 39. Agrawal discloses matrices, but the Patent Office has not cited to any particular portion of Agrawal that teaches a spatial coding matrix comprising a respective set of spatial coding weights for each of the receivers. There is no teaching or suggestion in Agrawal that there is a respective set of spatial coding weights **for each of the receivers**. Claim 39 is thus patentable over Agrawal since Agrawal does not teach each and every element of claim 39.

Claims 40-43, 48, and 49 depend from claim 39 and include all of the limitations of claim 39. Claims 40-43, 48, and 49 are thus patentable over Agrawal for at least the same reasons set forth above with respect to claim 39.

Claim 50 is an independent claim and contains similar limitations to the limitations in claim 39. In particular, claim 50 recites “receiving from the transmitter one of a plurality of demodulation matrices for demodulating subsequently received communication signals to which spatial coding weights comprising **respective sets of spatial coding weights for a plurality of receivers** have been applied.” As discussed above, Agrawal does not disclose respective sets of spatial coding weights for each of a plurality of receivers. The Patent Office has not indicated anything in Agrawal that is equivalent to the claimed demodulation matrices and respective sets of spatial coding weights. Accordingly, claim 50 is patentable over Agrawal for the same reasons set forth above with respect to claim 39.

Claim 51 depends from claim 50 and includes all of the limitations of claim 50. Claim 51 is thus patentable over Agrawal for at least the same reasons set forth above with respect to claim 50.

Claim 52 is an independent claim and contains similar limitations to the limitations in claims 39 and 50. In particular, claim 52 recites a processor configured to determine channel state information for each of a plurality of communication channels between the network element and the plurality of communication terminals, to determine a spatial coding matrix

comprising a respective set of spatial coding weights for each of the plurality of communication terminals based on the channel state information, and to apply the respective set of spatial coding weights in the spatial coding matrix to the signals. As discussed above, Agrawal does not teach a spatial coding matrix comprising a respective set of spatial coding weights for each of the plurality of communication terminals. Thus, Agrawal does not teach each and every element of claim 52. Claim 52 is therefore not anticipated by Agrawal.

Claims 53-55 depend from claim 52 and include all of the limitations of claim 52. Claims 53-55 are thus patentable over Agrawal for at least the same reasons set forth above with respect to claim 52.

In addition, the Patent Office has not indicated what in Agrawal is equated to the claimed beamformers in claim 54. Accordingly, claim 54 is patentable for this additional reason.

Claims 10-12, 23-25, 33, 36, and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Agrawal in view of U.S. Patent Application Publication No. 2005/0053170 A1 to Catreux et al. (hereinafter “Catreux”). Applicant respectfully traverses. To establish *prima facie* obviousness, the Patent Office must show where each and every element of the claim is taught or suggested in the combination of references. M.P.E.P. § 2143.03.

Claims 10-12 variously depend from claim 16 and contain all of the limitations of claim 16. Claims 23-25 variously depend from claim 17 and contain all of the limitations of claim 17. Claim 33 depends from claim 32 and contains all of the limitations of claim 32. Claims 36 and 37 variously depend from claim 35 and contain all of the limitations of claim 35. Thus, each of the dependent claims 10-12, 23-25, 33, 36, and 37 are patentable based on their dependency from the allowable independent claims. In particular, as discussed above, Agrawal does not teach or suggest receiving a subset of the weighted signals over a sub-group of the plurality of communication channels and Agrawal also does not disclose decoding the subset of the weighted signals using inverses of the pre-coding signal weights based on channel state information associated with the sub-group of the plurality of communication channels, as recited in the claimed invention. Catreux does not cure the deficiencies of Agrawal in this regard. Catreux is cited merely for its alleged disclosure of interference cancellation. Thus, the combination of Agrawal and Catreux does not teach or suggest each and every element of claims 10-12, 23-25, 30, 33, 36, and 37. Claims 10-12, 23-25, 30, 33, 36, and 37 are therefore patentable.

Claim 21 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Agrawal in view of U.S. Patent No. 5,828,658 to Ottersten et al. (hereinafter “Ottersten”). Applicant respectfully traverses. The standards for obviousness are set forth above.

Claim 21 depends indirectly from claim 17 and includes all of the limitations of claim 17. Thus, claim 21 is patentable based on its dependency from the allowable independent claim. In particular, as discussed above, Agrawal does not teach or suggest “receiving a subset of the weighted signals over a sub-group of the plurality of communication channels” and Agrawal also does not disclose decoding the subset of the weighted signals using inverses of the pre-coding signal weights based on channel state information associated with the sub-group of the plurality of communication channels, as recited in the claimed invention. Ottersten does not cure the deficiencies of Agrawal in this regard. Ottersten is cited merely for its disclosure of the Moore-Penrose pseudo-inverse matrix. Thus, the combination of Agrawal and Ottersten does not teach or suggest each and every element of claim 21. Claim 21 is therefore patentable over the cited references.

The present application is now in condition for allowance and such action is respectfully requested. The Examiner is encouraged to contact Applicant’s representative regarding any remaining issues in an effort to expedite allowance and issuance of the present application.

Respectfully submitted,
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